

The first lowland species of the Holarctic alpine ground spider genus *Parasyrisca* (Araneae, Gnaphosidae) from Hungary

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Abstract

The first lowland species of the alpine genus *Parasyrisca*, *Parasyrisca arrabonica* Szinetár & Eichardt, **sp. n.**, is described from the sandy grasslands of Hungary. The genus was hitherto known only from Western Europe (Pyrenees and Western Alps) and Eastern Europe (Crimea), and although records from Slovenia and Romania were known, these are listed in check-lists in both cases as doubtful since no voucher specimens are available. Thus this species is not only the first representative of *Parasyrisca* in the Hungarian fauna and in the Pannonian region, but is the first verified record of the genus in Central Europe too. *Parasyrisca arrabonica* seems to belong to the speciose *potanini* group (of which this is the first European record and the westernmost occurrence to date), and is especially similar to *P. turkenica* Ovtsharenko, Platnick & Marusik, 1995 and *P. songi* Marusik & Fritzén, 2009. Detailed descriptions of the species' ecological characteristics (habitat, co-occurring species) are provided, as its habitat preference is unusual and unique within the genus. This species is quite rare: only eight specimens have been found among 20700 captured spiders. Adult specimens have been collected exclusively in late autumn and early spring (so practically outside the major collecting period), which might explain why this species was not discovered earlier.

Keywords

New species, Pannonian lowland, sandy grassland, steppe, *Parasyrisca arrabonica* sp. n.

Introduction

The alpine ground spider genus *Parasyrisca* Schenkel, 1963 is among the “well-known” gnaphosid genera of the Holarctic (Ovtsharenko et al. 1995; Marusik and Fritzén 2009). So far 47 species have been described (Platnick 2009; Marusik and Fritzén 2009), but there are probably still more awaiting discovery. While Ovtsharenko et al. (1995) covers pretty much the Eurasian highlands (Fig. 18) and European mountains (Alps, Pyrenees), exploration of the Chinese and Iranian highlands has only now started (Marusik et al. 2006), and there are discoveries to be made in the highlands of Afghanistan, Pakistan and India too. Thus discovering a new *Parasyrisca* species is not that surprising, as the majority of suitable Eurasian alpine habitats have *Parasyrisca* species which are probably endemic to that very mountain (Mikhailov and Mikhailova 2000; Marusik 2003). However, *Parasyrisca arrabonica* was found not in high or even low mountains, but at three localities in two separate lowland areas, ca. 100 m above sea level, in the fairly isolated Pannonian sandy grasslands (Figs 15-17, 19).

Natural sandy grasslands are one of the remaining typical habitat types of the Hungarian grasslands, once found in large numbers in Hungary and the Carpathian Basin. The most comprehensive habitat assessment of the Pannonian sandy grasslands to date was started within the framework of the project “*Monitoring dry grasslands*” NBmR, in 2000 (Szinetár et al. 2005; Vörösházi 2006). In this project, collections were carried out in three main regions of Hungary: in Kiskunság, in Nyírség and in the Kisalföld sandy grasslands, the three major sandy areas of the Carpathian Basin. During this monitoring program about 155 species have been found, represented by 20700 specimens, among which eight belong to a new gnaphosid taxon found at three separate localities (Bugac, Orgovány and Györszentiván). These relatively large spiders (Figs 13-14) belong to the genus *Parasyrisca*, hitherto not known from Hungary, and only doubtfully recorded from the Carpathian Basin (Fig. 19) and thus without any verified records in Central Europe. From the Alföld (Hungarian Plain) only males (6), while in the Kisalföld (Small Hungarian Plain) one male and one female specimens were found. Adults were all captured in autumn and early spring, which are the least collected periods of the year and probably explains why this species remained undiscovered for such a long time. This was the case for *Alopecosa psammophila* Buchar, 2001, a large wolf spider also recently found, but as collecting periods have been modified to its phenology it has been found in larger quantities in many localities (Szinetár et al. 2005; Esysunin et al. 2007). Modified collecting methods also resulted in discoveries even from habitats very close to human settlement, like *Pelecopsis loksai* Szinetár & Samu, 2003 (applying D-Vac 500 m from city border of Budapest see Szinetár and Samu 2003) or *Trebacosa europaea* Szinetár & Kancsal, 2007 (applying swimming pitfall traps within the small town of Agárd next to the Velence lake, see Szinetár and Kancsal 2007).

Besides the unusual habitat choice, this species belongs to a different group, the *potanini* group, compared to the remaining European species *Parasyrisca vinosa* (Simon, 1878) and *P. marusiki* Kovblyuk, 2003 (which belongs to the *vinosa* group sensu Kovblyuk 2003).

Methods

All specimens were collected via pitfall traps. Identification, study and drawings were carried out at the Berzsenyi College's Department of Zoology, Arachnological Laboratory, using a Leica MZ6 stereo microscope. Drawings were made by János Eichardt. Digital images were taken in the Danish Natural History Museum, using a Nikon DXM1200F attached to the Leica MZ16A microscope and edited using the software packages Auto-Montage and Adobe Photoshop. All morphological measurements are given in millimeters. The format of the descriptions and standard abbreviations of morphological terms follow Ovtsharenko et al. (1995) and Marusik and Fritzén (2009). Specimens are deposited in the Hungarian Natural History Museum, Budapest (HNHM – holotype, paratype female), the University of West Hungary, Szombathely (UWH – five paratype males) and the Danish Natural History Museum, Copenhagen (ZMUC – one paratype male).

Maps have been downloaded from the NOAA Satellite and Information Service's National Geophysical Data Center (<http://www.ngdc.noaa.gov/mgg/topo>) and edited in Adobe Photoshop.

Taxonomy

Parasyrisca arrabonica Szinetár & Eichardt, sp. n.

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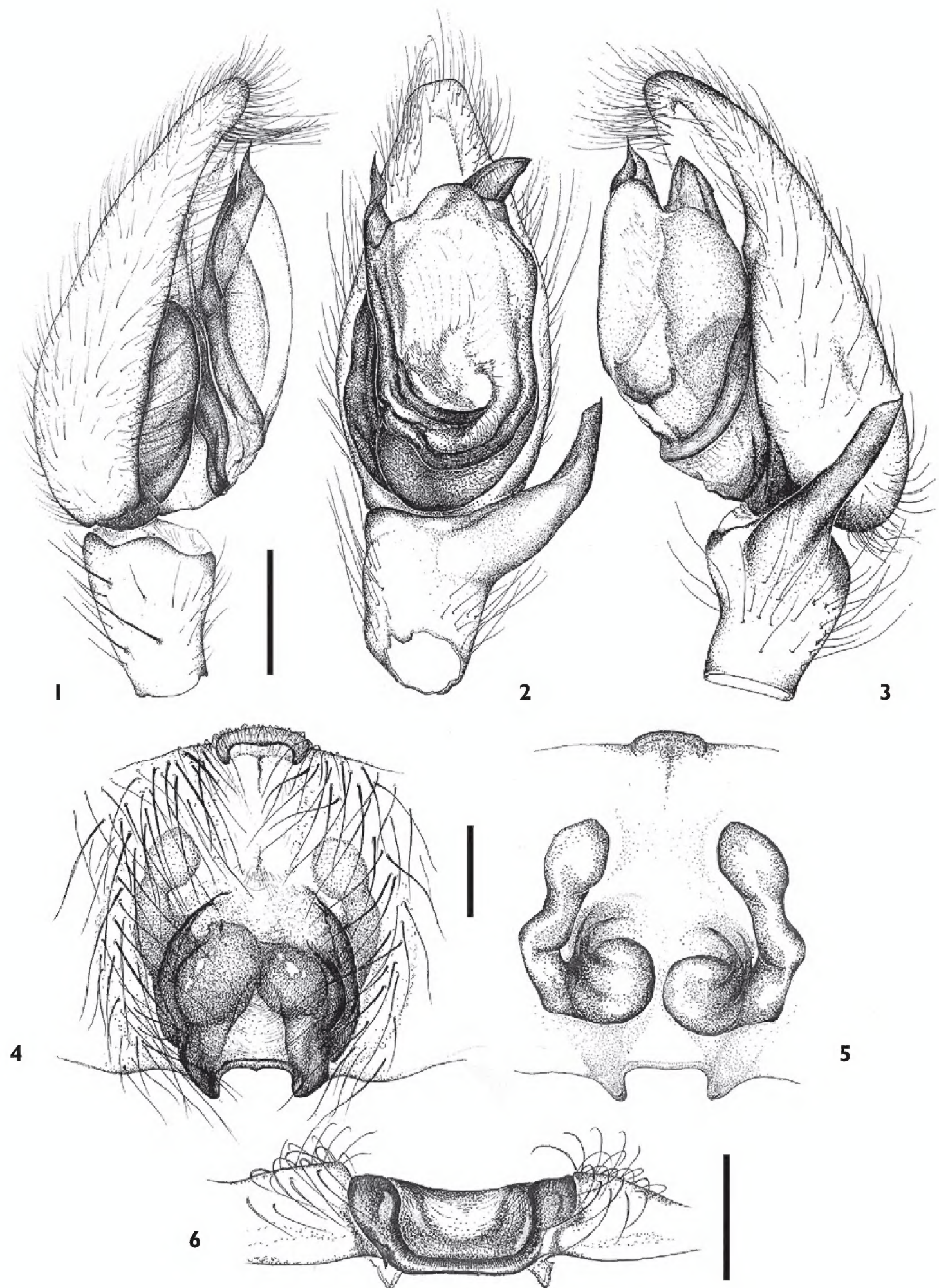
Figs 1-17

Material examined. Type material. Holotype. Male (NHMH) from Hungary, Györszentiván, Gazdák erdeje, N 47°42'56", E 17°47'33", 125 m, Barber traps, 01.10-02.12.2004, leg. Cs. Szinetár.

Paratypes. 1 female (NHMH) from the same locality, Barber traps, 15.01-02.04.2005, leg. Cs. Szinetár; 1 male from Bugac N 46°39'36", E 19°35'14", 110 m, Barber traps, 02.09.2003, leg. Cs. Szinetár; 3 males (2-UWM, 1-ZMUC) from the same locality, Barber traps, 04.10-18.10.2003, leg. R. Gallé; 2 males from Orgovány N 46°42'25", E 19°30'57", 100 m, Barber traps, 02.10.2007, leg. Cs. Szinetár.

Etymology. The species' name refers to the type-locality. Arrabonicum is the Latin name of the Kisalföld.

Remarks. *P. arrabonica* Szinetár & Eichardt, sp. n. belongs to the *potanini* species-group. It is quite similar to *P. turkenica* Ovtsharenko, Platnick & Marusik, 1995 and *P.*

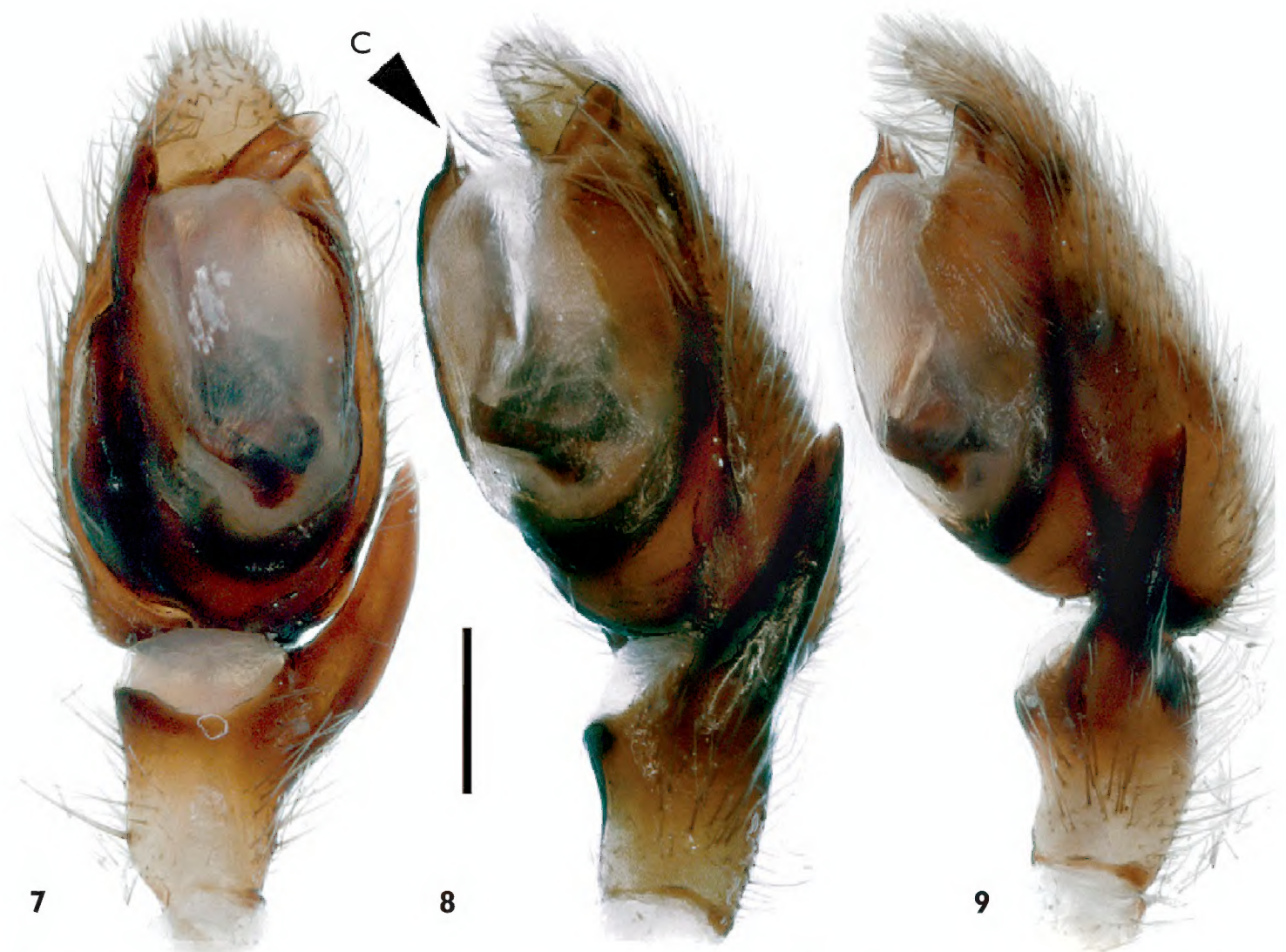


Figures 1-6. *Parasyrisca arrabonica* Szinetár & Eichardt, sp. n.: Male holotype: **1** pedipalp, prolateral view **2** same, ventral view **3** same, retrolateral view. Female: **4** epigyne, ventral view **5** vulva, dorsal view **6** posterior ridge (PRE) of the female epigyne, rear view. Scale bars: **1-3** 0.3 **4-6** 0.2.

songi Marusik & Fritzén, 2009, in having a long RTA (Figs 2, 3, 7-9), and a blunt terminal apophysis (Figs 2, 7, 10); these three species might even deserve a separate species-group. However, without detailed comparative study of the two taxa mentioned above or a cladistic analysis to judge the shared characters we are reluctant to propose a formal new group, but feel the similarity is worth mentioning.

Diagnosis. Males resemble those of *P. turkenica*, but can be easily recognized by the shorter and thicker retrolateral tibial apophysis (Figs 2, 3, 7-9) and the thinner and straight, erect conductor (Figs 2, 7, 8, 10). The shape of the tibial apophysis is similar to that of *P. songi* in lateral view but significantly smaller (Figs 3, 8, 9) and the conductor and terminal apophysis are somewhat different (Figs 2, 7, 10). The epigyne of *P. arrabonica* Szinetár & Eichardt, sp. n. (Fig. 4) is similar to that of *P. turkenica* but the shape of the anterior hood differs, being twice as wide as high, with the epigynal plate depressed at the posterior end as a posterior ridge of a flat U shape, with two pointing tips on the sides (Fig. 4).

Description. Male. Habitus as seen in Figs 13-14. Total length 7.1. Carapace 2.6 long, 2.1 wide. Femur II 2.2 long. Eye sizes and interdistance: AME 0.16, ALE 0.14, PME 0.14, PLE 0.12; AME - AME 0.08, AME - ALE 0.04, PME - PME 0.1, PME - PLE 0.14, ALE - PLE 0.16; MOQ length 0.46, front width 0.36, back width 0.4.



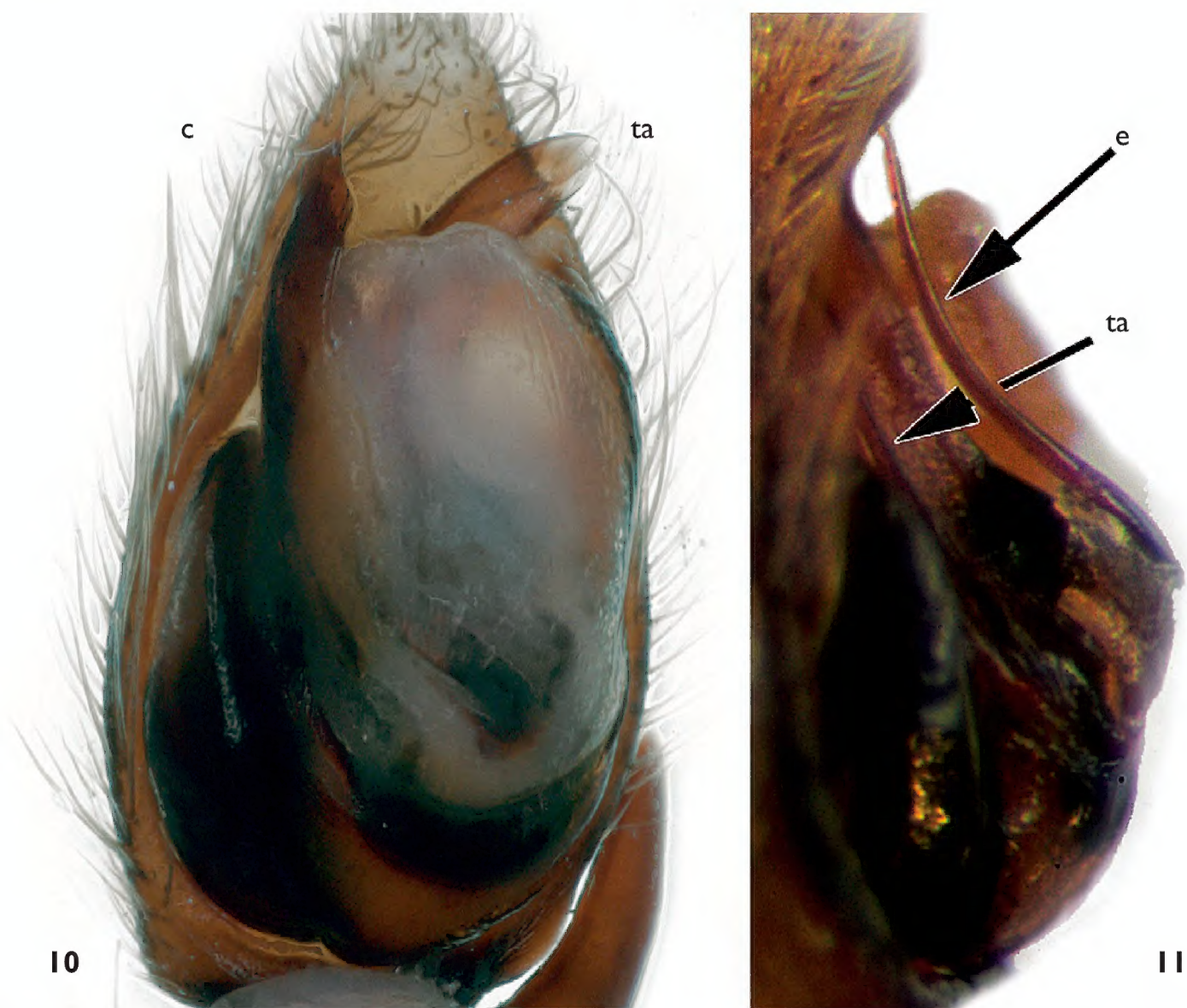
Figures 7-9. *Parasyrisca arrabonica* Szinetár & Eichardt, sp. n. **7** male pedipalp, ventral view **8** same, semi-retrolateral view, showing the pointed tip of the conductor (c – arrowed) **9** same, retrolateral view. Scale bar = 0.3.

Leg spination: femora ; I,II d 1-1-0, p 0-0-1; III d 1-1-0, p 0-1-1, r 0-0-1; IV d 1-1-0, (without prolateral spine), r 0-0-1; tibiae I v 2-2-0; II v 1-1-0; III v 1-1-2, p 1-1-0, r 1-1-0; IV v 1-2-2, p 0-1-1, r 1-0-1; metatarsi I-II v 2-0-0; III v 2-0-2, p 2-0-2, r 2-0-2; IV v 1-0-2, p 2-0-2, r 2-0-2.

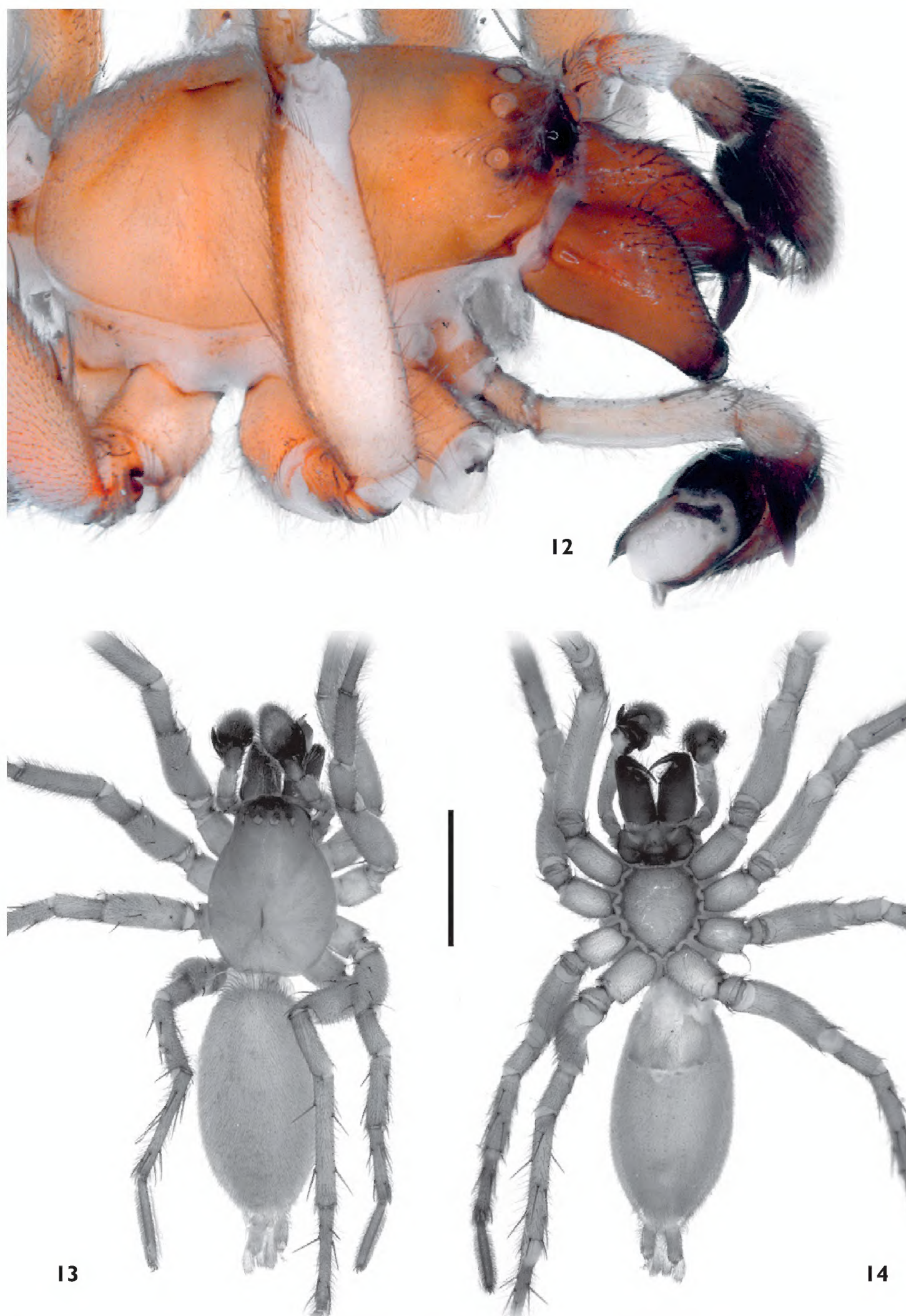
Palps (Figs 1-3, 7-11) with strong, well developed, long RTA (Figs 2-3), reach $\frac{1}{4}$ of cymbium length (Figs 2-3, 7-9). RTA tip seems abrupt in lateral view. Conductor (Fig. 10) twisted, directed upward (Fig. 2), gradually tapered at end, twisted in shape (Figs 2, 10), with thin tip (Fig. 8) clearly visible in frontal and lateral views. Embolus unusually long, largely covered by conductor, visible only after conductor is removed (Fig. 11). Terminal apophysis thick, curved toward sides (Figs 2-3, 10).

Colouration. (Fig. 12) Legs yellowish-brown, tibia, metatarsus and tarsus slightly darker than proximal segments. Carapace also yellowish-brown, but head somewhat darker. Chelicerae, cymbia, gnathocoxae and labium also darker brown. Abdomen grayish-brown with a few narrow, light brown stripes at the posterior end, just before the spinnerets.

Female. Total length 9.2. Carapace 3.3 long, 2.3 wide. Femur II 2.2 long. Eye sizes and interdistance: AME 0.16, ALE 0.14, PME 0.16, PLE 0.12; AME - AME 0.1,



Figures 10-11. *Parasyrisca arrabonica* Szinetár & Eichardt, sp. n. male bulb, close-ups: **10** male pedipalp, ventral view, close-up **11** bulb, prolateral view, conductor removed (c – conductor, e – embolus, ta – terminal apophysis), showing the long embolus and base of the terminal apophysis.



Figures 12-14. *Parasyrisca arrabonica* Szinetár & Eichardt, sp. n., male habitus: **12** paratype from Orgovány, prosoma, dorsolateral view, showing the strong setae on the paturon **13** same specimen, dorsal view **14** same specimen, ventral view. Scale bar = 2.0.

AME - ALE 0.04, PME - PME 0.12, PME - PLE 0.16, ALE - PLE 0.18; MOQ length 0.52, front width 0.36, back width 0.4. Leg spination: femora; I,II d 1-1-0, p 0-0-1; III d 1-1-0, p 0-0-1, r 0-0-1; IV d 1-1-0, (without prolateral spine), r 0-0-1; tibiae I v 2-2-0; II v 1-1-0; III v 1-1-2, p 1-1-0, r 1-1-0; IV v 1-2-2, p 0-1-1, r 0-1-1; metatarsi I-II v 2-0-0; III v 2-0-2, p 2-0-2, r 1-0-1; IV v 1-1-2, p 2-0-2, r 2-0-2.

Female genitalia (Figs 4-6) Epigyne elongate, with length/width ratio 1.7. Anterior hood twice as long as wide (Fig. 4), atrium elongated as in *P. songi*. Epigynal plate depressed at the posterior end, posterior ridge (PRE) invaginated from the posterior end having a two-pointed tip at the sides (Fig. 4). As seen in rear view (Fig. 6), PRE U-shaped (as the epigynal plate depressed), which is in an inverted position compared to other *Parasyrisca* species. Spermathecal ducts directed upwards and curved inwards (Fig. 5). Ducts significantly stronger than that of *P. turkenica*.

Colouration. Similar to that of male, but carapace with more distinct pattern: three radially directed dark stripes present on both sides of fovea.

Biology. The well-developed chelicerae equipped with strong spines (Fig. 12) suggest that this is a sand-dwelling species. All the adults (as immatures were not considered in the NBmR) were captured between late September and early April. Thus it seems likely that this species overwinters as adults.

Habitat preference. (Figs 15-17) We collected the specimens in the calciferous open sand steppes (coenologic name *Festucetum vaginatae danubiale*) in the area between the rivers Danube and Tisza and on the Kisalföld.

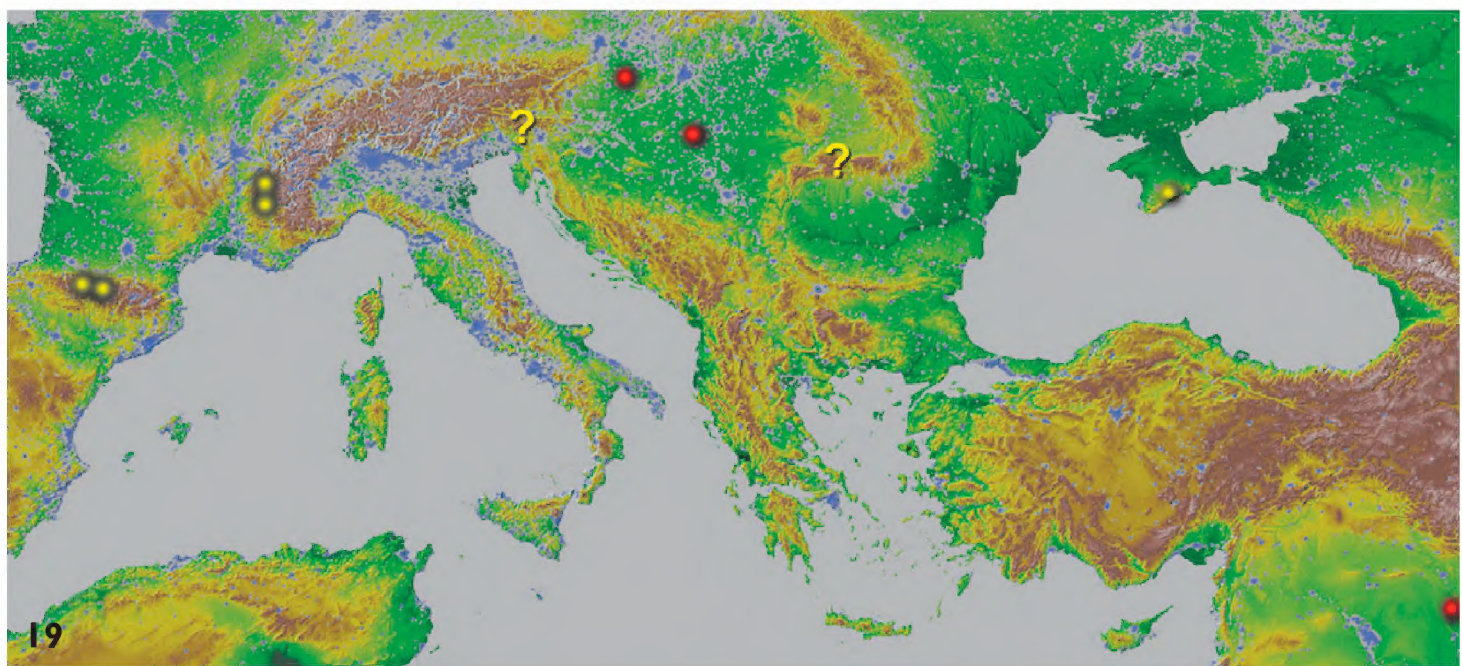
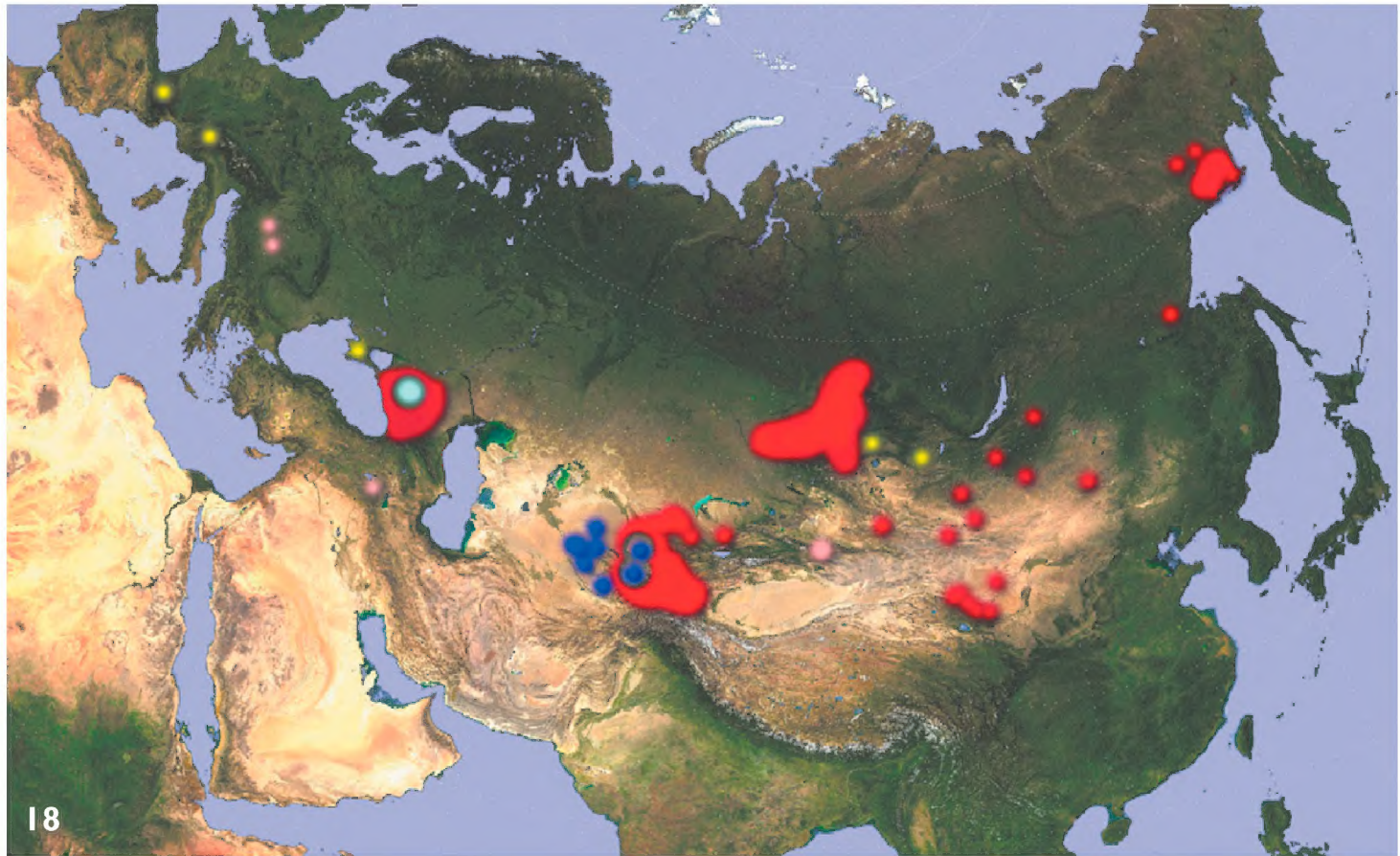
Distribution. (Figs 18-19) Known from Hungary only. From the type locality (Györszentiván) and from two collecting sites of the Kiskunság area: Bugac and Orgovány.



Figures 15-17. Seasonal vegetation changes on the habitat of *Parasyrisca arrabonica*: **15** summer vegetation dominated by the late-coming pink (*Dianthus serotinus*) **16** winter vegetation of the habitat **17** spring vegetation characterized by different feather grasses (*Stipa capillata*, *S. borysthena*).

Discussion

In their monographic work, Ovtsharenko et al. (1995) sorted the species into four groups: the *guzeripli* (1 species), the *breviceps* (10 species), the *vinosa* group (3 species, see also Kovblyuk 2003, Marusik and Fritzén 2009) and the *potanini* group (32 species). While the *guzeripli* and the *breviceps* groups are restricted to a smaller geographical range (Fig. 18), i.e. the Caucasus and Kyrgyzstan-Tajikistan respectively, the *vinosa*



Figures 18-19. Distribution maps of the genus *Parasyrisca*: **18** Eurasian distribution of the species groups of *Parasyrisca* (red, pink – *potanini* group, pink – *P. arrabonica*, *P. turkenica*, *P. songi*, yellow – *vinosa* group, light blue – *guzeripli* group, dark blue – *breviceps* group) **19** European distribution of *Parasyrisca* (red – *potanini* group, yellow – *vinosa* group). Yellow question marks represent doubtful records.

and the *potanini* group are distributed across a much wider (Fig. 18) area (this might be an artifact of insufficient biogeographical data). Thus *Parasyrisca* species occur in most mountain systems across the Palearctic with 46 species, and in the Nearctic with 1 species (southern British Columbia in Canada and western Washington State in the United States; see Ubick 2005).

Parasyrisca species were previously thought to occur at high elevations only, mostly in the alpine zones of mountains on the montane tundra, mainly between 600 and 2200 m (Ovtsharenko et al. 1995), although Marusik (2003) reported finding *P. holmi* also close to the seashore and thus at sea level. Based on the available data, *P. arrabonica* sp. n. is a typical member of sandy plain habitats with the sandy steppe vegetation. These habitats are located at elevations only 100-125 m above sea level, although it is possible that representatives of this genus can be found in the high mountains of the Carpathian regions (Fig. 19) bordering the Pannon region as two tentative records of *P. vinosa* are present in the literature (Nikolić and Polenec 1981 in Grimm 1985, and Weiss and Urák 2000), in the Eastern Alps or in the Carpathian mountains.

Based on available data we conclude that *Parasyrisca arrabonica* is a rare, but probably generally occurring species among the ground-dwelling spider communities in the sandy grasslands (Figs 15-17) of the Hungarian plains in the Carpathian Basin. On the basis of the other spiders co-occurring with *P. arrabonica* we suspect that this species may occur in the similar dry sandy habitats of southern Moravia, in southern Slovakia and in the sandy steppe habitats of northern Serbia (as was the case of the *Alopecosa psammophila*).

These sand steppes (*Festucetum vaginatae danubiale*) are dominated by the following plant species: *Festuca vaginata*, *F. pseudovina*, *Stipa borysthena*, *S. capillata*, *Koeleria glauca* and *Dianthus serotinus*. The vegetation changes significantly during different seasons: during summer (Fig. 15) the late-coming pink (*Dianthus serotinus*) is typical, while during springtime the vegetation (Fig. 17) is characterized by different feather grass species (*Stipa* spp.). During winter vegetation coverage is mainly by dead or dry vegetative parts of plants (Fig. 16). The above described sandy steppe has a rather distinct spider fauna (Szinetár et al. 2005; Esysunin et al. 2007). These habitats accommodate specialist spiders and although it is premature to draw ecological conclusions on the basis of slightly more than a half-a-dozen specimens, it is worth mentioning that *Parasyrisca arrabonica* co-occurs with *Alopecosa psammophila* Buchar, 2001, *A. mariae* (Dahl, 1908), *A. sulzeri* (Pavesi, 1873), *Berlandina cinerea* (Menge, 1872), *Sintula spiniger* (Balogh, 1935), *Improphantes geniculatus* (Kulczyński, 1898), *Aelurillus v-insignitus* (Clerck, 1757), *Pardosa bifasciata* (Hahn, 1826), *Callilepis nocturna* (Linnaeus, 1758) and *Dictyna szaboi* Chyzer, 1891. The sandy steppe vegetation reaches its westernmost occurrence in Hungary, and such habitats exist in Eastern Europe to a large extent. The spider fauna is rather distinct and characterized by almost the same species (compare Szinetár et al. 2005 vs. Esysunin et al. 2007), even several thousand kilometers away, as has been discussed by Esysunin et al. (2007). Their list overlaps with the Hungarian spider list from the same type of vegetation significantly, suggesting that the spider fauna of the sandy grasslands consists of species which are characteristic for

dry, open, sandy and rocky habitats regardless of the soil type. However, a relatively small number of species (8% Szinetár unpubl. data) appears almost exclusively connected to sandy habitats, and are therefore considered “*psammophilous*”. *Parasyrisca arrabonica* probably belongs among these taxa too, although our data are insufficient to make an unequivocal statement. Other – well proven – psammophilic species are *Alopecosa psammophila* and *Berlandina cinerea*, which have been found in great abundance, whereas others, like *Dictyna szaboi*, are represented only by a few specimens.

Parasyrisca arrabonica is apparently a typical, but very rare gnaphosid spider of sandy open grassland (or steppe) habitats, and overwinters as adults, which makes them hard to collect. However, suitable vegetation/habitat types are found in numerous other places outside of Hungary, and we encourage our colleagues to extend or modify their collecting periods, which might improve their chances of capturing this species.

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References

- Esyunin SL, Tuneva TK, Farzalieva GS (2007) Remarks on the Ural spider fauna (Arachnida, Aranei), 12. Spiders of the steppe zone of Orenburg Region. *Arthropoda Selecta* 16 (1): 43-63.
- Grimm U (1985) Die Gnaphosidae Mitteleuropas (Arachnida, Araneae). *Abhandlungen des naturwissenschaftlichen Vereins in Hamburg* 26: 1-318.
- Kovblyuk MM (2003) Two new species of spiders of the family Gnaphosidae (Aranei) from the Crimea. *Zoolgicheskii Zhurnal* 82: 880-883.
- Marusik YM (2003) Fauna and populations of the petrophilous spiders (Arachnida: Araneae) of north-east Siberia and north-west Canada. In: Logunov DV, Penney D (Eds) *Proceedings of the 21st European Colloquium of Arachnology*, St.-Petersburg (Russia), 4–9 August 2003, 185-200.

- Marusik YM, Fritzén NR, Song DX (2006) On spiders (Aranei) collected in central Xinjiang, China. *Arthropoda Selecta* 15 (3): 259-276.
- Marusik YM, Fritzén NR (2009) A new species of *Parasyrisca* (Araneae: Gnaphosidae) from Xinjiang, China. *Zootaxa* 1982: 63-65.
- Mikhailov KG, Mikhailova EA (2002) Altitudinal and biotopic distribution of the spider family Gnaphosidae in North Ossetia (Caucasus Major). In: Toft S. & Scharff N. (Eds), *Proceedings of the 19th European Colloquium of Arachnology*, Århus (Denmark), 17-22 July 2000 Århus University Press, Århus, 261-265.
- Nikolić F, Polenec A (1981) *Aranea. Catalogus Faunae Jugoslaviae III/4*. SAZU, Ljubljana, 135 pp.
- Ovtsharenko VI, Platnick NI, Marusik YM (1995) A review of the Holarctic ground spider genus *Parasyrisca* (Araneae, Gnaphosidae). *American Museum Novitates* 3147: 1-55.
- Platnick NI (2009) The world spider catalog, version 9.5. American Museum of Natural History, online at <http://research.amnh.org/entomology/spiders/catalog/index.html>
- Szinetár Cs, Kancsal B (2007) *Trebacosa europaea*, a new wolf spider from Hungary (Araneae, Lycosidae). *Journal of Arachnology* 35: 153-158.
- Szinetár Cs, Samu F (2003) *Pelecopsis loksai* sp. n., a new erigonine spider from Hungary (Araneae: Linyphiidae). *Bulletin of the British Arachnological Society* 12(9): 412-414.
- Szinetár Cs, Eichardt J, Horváth R (2005) Data on the biology of *Alopecosa psammophila* Buchar, 2001 (Araneae, Lycosidae). *Journal of Arachnology* 33: 384-389.
- Ubick D (2005) Gnaphosidae. In: Ubick D, Paquin P, Cushing PE, Roth V (Eds). *Spiders of North America: an identification manual*. American Arachnological Society, 106-111.
- Vörösházi T (2006) Investigation of the ground-dwelling spider living in open sandy grassland in the Small Hungarian Plain (Gönyüi-erdő, 2004-2005). BSc. Thesis, Berzsenyi College, Szombathely, 54 pp. [in Hungarian]
- Weiss I, Urák I (2000) Faunenlisten der Spinnen Rumäniens (Arachnida: Araneae). <http://www.arachnologie.info/fauna.htm> [accessed 31.I.2009]